Wetting Behavior of Ar and Ne on Weakly Binding Substrates from Density Functional Calculations

F. Ancilotto and F. Toigo
INFM and Dipartimento di Fisica
Universita' di Padova
35100 Padova, Italy

Since the original prediction that liquid Helium does not wet the surface of Cesium at low temperatures and the soon after experimental observation of a wetting transition on this system, noble gases on alkali metal surfaces have become model systems for the study of wetting transitions and of their accompanying line of prewetting transitions off coexistence.

Here we present results on the wetting properties of Ar and Ne adsorbed on Li and Na surfaces obtained with the use of the Density Functional theory and of accurate ab-initio potentials to model the gas-substrate interactions. Evidence for prewetting transitions is found for all the systems investigated and their wetting phase diagrams are calculated.

In the search for sufficiently weak substrates where prewetting transitions of noble gases might be observed we have extended our study to the surface of solid CO_2. We find triple-point wetting for Ar, whereas for Ne our results suggest thata wetting transition occurs at a temperature about 5 K below the bulk critical temperature, accompanied by the characteristic first-order prewetting transitions slightly away from coexistence.